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ABSTRACT

Anabolic-androgenic steroids (AS) are pharmacologic derivatives of the hormone testosterone. They have therapeutic merit when used under a physician's prescription to treat certain hormonal imbalances and some forms of anemia; however, when taken in high doses they have a number of virilizing, feminizing, toxic, and psychological effects. This study was conducted to determine the knowledge about, attitudes toward, and extent of use of AS among 10th, 11th, and 12th grade students at a northwest Ohio high school. Questionnaires completed by 1,057 students revealed that, of the 53 students who indicated that they were taking steroids, 4 gave legitimate medical reasons for doing so. Thus, 4.6% of the student population was taking steroids illegitimately. Of those students admitting use, 95.9% were male, with the greatest percentage of users being seniors (38.8%) or juniors (36.7%). Many had misunderstandings and misconceptions concerning the properties and side effects of AS, and in general, many did not condone the use of AS. The typical high school student who used AS was a junior or senior male who had obtained steroids on the black market (49.0%) or from fellow athletes (44.9%) and who was taking more than one steroid preparation several times per week for the purpose of enhancing performance. (NB)

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Anabolic-Androgenic Steroids: Knowledge About, Attitude Toward, and Extent of Use by High School Students

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ABSTRACT

Anabolic-androgenic steroids (AS) are pharmacologic derivatives of the hormone testosterone. They have therapeutic merit when used under a physician's prescription to treat certain hormonal imbalances and some forms of anemia; however, when taken in high doses they have a number of virilizing, feminizing, toxic, and psychological effects. This study was done to determine the knowledge about, attitude toward, and the extent of AS use among 10th, 11th, and 12th grade students at a northwest Ohio high school. Of the 1461 questionnaires distributed, 1057 were returned (72.3%). It was found that 4.6% of the student population was taking steroids illegitimately, many had misunderstandings and misconceptions concerning the properties and side effects of AS, and in general did not condone the use of AS. The typical high school AS user was a junior or senior male, obtained AS on the black market, was taking more than one AS preparation several times per week for the main purpose of enhancing performance.

Anabolic-androgenic steroids (AS) are pharmacologic derivatives of the male hormone, testosterone, but with more sustained or efficacious anabolic (tissue building) and androgenic (masculinizing) actions. They were originally created and continue to be used for the purpose of androgen replacement therapy in hypogonadic men, in the therapy of osteoporosis and arthritis, in the stimulation of red blood cell synthesis in some forms of anemia, and in the treatment of breast cancer in females.[1,2] The use of these compounds by healthy

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individuals, however, is of greater medical and societal importance because the vast majority of AS use may be more precisely categorized as "abuse."[3] It should be emphasized that for their non-clinical purposes anabolic steroids are not taken in therapeutic doses but in supraphysiologic doses that are 10 and 40 times larger.[4,5,6]

The deleterious side effects of AS include virilizing actions in young boys and women,[6] impairment of liver function and cardiovascular abnormalities (possibly life threatening), premature cessation of long bone growth, hirsutism (heavy, abnormal hair growth), acne, coarsening of the voice, hypertrophy of the clitoris, development of gynecomastia (female breast tissue) and in men male-pattern baldness.[7,8,9] These effects are largely irreversible even after steroid administration is discontinued.[1] Additional but more temporary effects of AS are a disruption of normal circulating levels of the thyroid and pituitary hormones, testicular atrophy and eventual infertility.[9] Increased aggressiveness and "steroid psychosis"[10] are widely accepted traits of AS without any proven explanation. While all these symptoms are serious, perhaps the greatest effects, transient and residual, result from the acute changes in behavior that occur from steroid abuse. Broken homes, broken families, and a host of other socially deplorable circumstances have arisen with impact on both the user and his/her loved ones.[11,12,13]

Perhaps the incidents during the 1988 Summer Olympic Games in Seoul concerning the disqualification of several entrants, most notably Canadian sprinter Ben Johnson, have helped to alert the populace to the prevalence of AS use; however, many questions still exist as to how great a problem AS use is among adolescents.

Herbert A. Haupt, an orthopedic surgeon in St. Louis, Missouri, argues that the greatest abuse of AS is not in competitive athletics, but in the local health club.[14] He describes a frightening world inhabited by young men whose identity and self-esteem are bound up in a distorted body image: that of the overdeveloped muscleman.

Much of our American society revolves around the pursuit of a more "perfect" body, or athleticism. Advertisements are loaded with this type of body image, perhaps leading to the unconscious equation of fitness and physique with happiness and success in life. Therefore, it is not surprising that self-conscious adolescents, who still believe in an imaginary audience, have turned to steroid use to help in the attainment of the flawless physique. Several recent surveys have indicated an elevated rate of steroid use among adolescents.[15,16] In fact, one of those studies found that among 46 public and private high schools (N = 3403) across the nation, 6.6% of 12th grade male students use or have used AS.[15] According to another survey of high school football coaches in Michigan, the use of AS may be more common at larger high schools than smaller ones, particularly those in suburban areas.[17] The study also found that approximately 12% of the coaches estimated that at least one player on their squad used steroids for each of the three periods surveyed: 1) 1985 and before; 2) 1986; and 3) 1987. To cite another example, a polling of high school juniors, both athletes and non-athletes, from six Arkansas high schools found that 11% of the boys had used or were using steroids, while only 0.5% of the female respondents admitted to using the drugs.[18]

The problem of anabolic steroid abuse is both a medical and sociological issue. Previous studies of AS have documented the physical and psychological difficulties that can develop when a healthy individual abuses anabolic steroids; however, the magnitude of the impact of steroid abuse on society has not yet been determined. It is known that adolescents are especially sensitive to the effects of steroid use because it is at this time in their lives that they are developing the social skills and behavioral controls that are necessary for copying with normal puberty.[19] This study attempted to help determine how great a problem AS use is in a selected adolescent population. Each study of high school students completed previous to this study has had a limited sample. This study uses a different environment and a different sample in an attempt to help determine how widespread and consistent is AS use in an adolescent population. In addition, this study examined the knowledge about AS and the attitude toward AS use among high school students.

METHODS

Subjects

The public high school from which the subjects were obtained is located in a northwestern Ohio city with a population of 35,596 as of 1980. The city is characterized by widely diversified industry which supports both white and blue collar jobs. The per capita income, in 1987, was $10,903 (state average was $11,323). The median household's effective buying power was $30,381 (state average was $25,829). The 1980 census indicated that 96.8% of the residents of the city were Caucasian. The city is located in a rural county, with a population of 64,581, as of 1980, where the land is used primarily for farming.

The high school from which the 1,461 tenth, eleventh, and twelfth grade subjects were drawn has a typical graduation rate of 96.7%. In 1989 approximately 55% of the students pursued a four-year college degree, 21% chose business schooling, 15% full-time employment, 5% military, and 4% were undecided. Table 1 indicates the number of students to whom questionnaires were distributed and the number of questionnaires returned, by gender, within a grade.

Table 1

Number of Questionnaires Distributed and Returned

Broken Down by Gender within Grade

	Male			Female			Total		
Grade	Distributed	Returned	%	Distributed	Returned	%	Distributed	Returned	%
10	241	173	71.8	233	152	65.2	474	325	68.6
11	260	206	79.2	257	202	78.6	517	408	78.9
12	252	159	63.1	218	165	75.7	470	324	68.9
Total	753	538	71.4	708	519	73.3	1461	1057	72.3

There were 1057 responses from 1461 questionnaires distributed (72.3%) to students in grades 10 through 12. The greatest proportion of questionnaires were completed by eleventh graders (78.9%). Nearly equivalent numbers of responses were received from both males (538) and females (519).

Instrumentation

An 11-item questionnaire with several subparts, totaling 57 possible responses was developed by the researchers to obtain information concerning personal use of AS, knowledge about AS, and

attitudes toward AS use. The instrument was field tested for appropriateness for high school students by administering it to a small number of students from another high school as well as by consulting several adults experienced in high school teaching and adolescent drug abuse counseling.

A knowledge scale was constructed from students' responses to 16 questions concerning the therapeutic and detrimental effects of AS. The scores could range from zero (least knowledgeable) to 16 (most knowledgeable). The internal consistency reliability of the scale using Kuder-Richardson$_{21}$ formula was .82. An attitude scale was constructed from students' responses to five three-point Likert scales. The scores could range from five (accepting of AS use) to 15 (not accepting of AS use). The Cronbach alpha internal consistency reliability coefficient was .81. A concern of the researchers was the degree of honesty of student responses to a somewhat sensitive topic; however, previous findings in the field of drug abuse indicated that self-reporting of drug abuse by adolescents was sufficiently valid[20,21] and reliable[22,23] for research use, regardless of the setting in which it was administered.

Data Collection Procedures

Permission was sought and obtained from the high school principal to distribute the questionnaire. A letter was written to the high school homeroom teachers explaining the nature and intent of the survey. A packet of surveys was distributed to the teachers' mailboxes in the Spring of 1990 one day prior to the intended survey date. The instructions to the teacher indicated that the questionnaire would take at most 10 minutes to complete, requested the

teacher to remind students that their responses to the surveys would be anonymous, and asked that the teachers have a designated student collect the surveys, seal the envelopes, and return them to the researchers in the main office at the end of the homeroom period.

On the day of the survey, of the 71 teachers involved, 43 returned their packets by the end of the first day. The remaining 28 teachers were contacted and reminded to complete the survey the following day if possible. Two teachers refused to administer the survey; one of these teachers felt that the students would not understand the questions, and the other teacher refused, indicating that he/she would not take the time. Six other teachers did not return the surveys even after a second reminder. Thus, of the 71 teachers, 63 (88.7%) returned the survey packets.

Although the teachers were asked to distribute the questionnaires to all students, some teachers gave surveys only to students who requested them. In addition, some students chose not to complete the questionnaire.

RESULTS

Fifty-three students indicated that they were taking steroids; however, four of the 53 indicated legitimate medical reasons for taking them. Thus, illegitimate AS users comprised 4.6% (49/1057) of all the high school students surveyed (Table 2). Of those students admitting use, 47 were male (95.9%). Twelfth graders made up the greatest percentage of users (38.8%), followed closely by eleventh grade students (36.7%). Among those students reporting experience with AS, most were current users (61.2%). Of the senior males, 11.9% reported current or previous use of steroids for non-medical reasons;

while 8.7% of the junior males and 6.9% of the sophomore males admitted using AS.

The students made use of several sources in order to obtain AS. The "black market" (49.0%) and fellow athletes (44.9%) constituted the major avenues of supply. Doctors (12.2%), pharmacists (18.4%), and veterinarians (10.2%) were also mentioned as providers of AS. Additional sources were animal supply stores (10.2%) and mail order (12.2%). Fifteen of the users indicated that they obtained steroids from multiple sources. Seventeen of the 49 AS users (33.3%) did not respond to the question concerning procurement.

Respondents acknowledging personal steroid consumption indicated that the most frequently used injectable AS was testosterone (44.9%), followed by Deca-Durabolin (24.5%), Equipoise (22.6%), Parabolin (24.5%), and Finijet (20.4%). The most frequently used oral anabolic agents were Dianabol (36.7%), followed by Maxibolan and Winstrol (each 24.5%), and Anadrol and Anavar (each 22.4%) (Table 2). Twenty users were taking two to four different type of AS, while 33 were using five to eight different types.

Anabolic steroid users stated multiple reasons for their consumption, the most popular being performance enhancement (63.3%), followed by appearance improvement (46.9%), and peer pressure (16.3%). Most steroid-using individuals participated in athletics individually (59.2%) as well as on teams within the school (57.1%) and outside of school (53.1%) (Table 2). The longest continued time period of usage was listed as 50 months, while the shortest time span was two months (median = 9.0, mean = 16.7, mode = 12.0). The survey indicated that

the maximum number of AS administrations per week was 10, the minimum was one (median = 4.0, mean = 5.56, mode = 3.0).

Table 2

Profile of High School Anabolic-Androgenic Steroid Abuser

Variable	N	%
Gender		
Male	47	95.9
Female	2	4.1
Grade		
10th	12	24.5
11th	18	36.7
12th	19	38.8
Use		
Past	19	38.8
Current	30	61.2
Source of Steroids		
Animal Supply Store	5	10.2
Doctor	6	12.2
Fellow Athlete	22	44.9
Mail Order	6	12.2
Pharmacist	9	18.4
Street (Black Market)	24	49.0
Veterinarian	5	10.2
Type of Steroid Used		
Injectable		
Deca-Durabolin	12	24.5
Equipoise	12	22.6
Finijet	10	20.4
Parabolan	12	24.5
Testosterone	22	44.9
Oral		
Anadrol	11	22.4
Anavar	11	22.4
Dianabol	18	36.7
Maxibolan	12	24.5
Winstrol	12	24.5
Reason for Use		
Appearance Improvement	23	46.9
Performance Enhancement	31	63.3
Pressure from Peers	8	16.3
Participation in Sports		
School Team	28	57.1
Team Outside of School	26	53.1
Individually (not with a team)	29	59.2

Responses to questions concerning attitude toward use of AS produced the following results. Students responded to the statement, "AS use is okay because it is a victimless crime" as follows: 6.8% agreed, 18.4% were undecided, 63.2% disagreed, and 11.5% did not respond. Additionally, 1.5% thought steroid use to be fine because they considered it to be safe, 10.4% were unsure, 76.7% felt AS use was not alright, and 11.4% did not respond. When confronted with the statement, "AS use is okay because sports are more important than any problems that may result from its use," 3.1% agreed, 8.6% were undecided, 76.5% disagreed, and 11.8% did not respond. The majority of the students (66.0%) felt steroid use was not okay, 14.0% were undecided, 9.0% disagreed, and 11.0% claimed no response. Of the 62 comments written by the subjects in the "other" space provided, only four indicated that steroid use was okay for non-medical reasons.

Knowledge of and attitude toward the use of AS for several subgroups were compared using several one-way analyses of variance with an alpha level of .05. The analyses indicated that there were no differences in mean knowledge of AS between males and females ($p = .50$), grade levels ($p = .22$), AS users and non-users ($p = .47$), and current AS users and past users ($p = .48$). With respect to attitude toward AS use, there were no statistically significant differences among grade levels ($p = .96$) with respect to mean attitude toward AS use; however, three different group comparisons revealed statistically significant mean different ($p = .00$) positions with respect to the acceptability of AS use. Males and females did not condone AS use; however, females felt more strongly about that position than did males. AS users were undecided about the

acceptability of AS use while non-users were definitely against AS use. Past AS users were undecided about the acceptability of AS use while current users were also undecided but tended to cluster closer to the end of the scale associated with acceptance of AS use (Table 3).

Table 3

One-Way Analysis of Variance of Knowledge and Attitude for Several Comparison Subgroups

Variable	Comparison	N	M	S.D.	F-Ratio	Prob
Knowledge	Male	541	7.73	4.36	.045	.50
	Female	520	7.90	3.94		
	Tenth	325	8.11	3.87		
	Eleventh	410	7.57	4.34	1.54	.22
	Twelfth	327	7.83	4.17		
	Users	49	7.43	3.20	0.51	.47
	Non-Users	1001	7.86	4.18		
	Current Users	30	7.17	3.26	0.51	.48
	Past Users	19	8.44	3.15		
Attitude	Male	448	13.19	2.39	46.64	.00*
	Female	462	14.10	1.53		
	Tenth	285	13.66	1.93		
	Eleventh	336	13.65	2.18	0.37	.96
	Twelfth	291	13.62	2.06		
	Users	43	9.28	2.80	256.54	.00*
	Non-Users	860	13.86	1.77		
	Current Users	25	8.12	2.54	13.24	.00*
	Past Users	18	10.89	2.35		

*Indicates statistically significant difference because $p < .05$ alpha level.

Responses to questions concerning knowledge of therapeutic and detrimental effects of anabolic-androgenic steroids provided the following information. It can be observed that misconceptions about these particular drugs are rampant. For example, 65.3% thought AS to be physically addictive, 25.8% said that they improved cardiovascular endurance, 41.5% indicated that they believed them to cause hair loss, 11.4% indicated that AS prevented injury, and 11.1% thought AS increased resistance to disease (Table 4).

Table 4

Responses to Questions Concerning Knowledge of Therapeutic and Detrimental Effects of Anabolic-Androgenic Steroids

Effects	Yes		No		No Response	
	N	%	N	%	N	%
Are Phys. Addictive	697	65.3	155	14.5*	216	20.2
Build Muscle	718	67.2*	147	13.8	203	19.0
Improve CV Endurance	276	25.8	522	48.9*	270	25.3
Cause Hair Loss	443	41.5	358	33.5*	267	25.0
Increase Aggression	650	60.9*	171	16.0	247	23.1
Cause Liver Damage	633	59.3*	183	17.1	252	23.6
Increase Strength	694	65.0*	159	14.9	215	20.1
Cause Reprod. Problems	775	72.6*	81	7.6	212	19.9
Masculinize	556	52.1*	250	23.4	262	24.5
Change Behavior	706	66.1*	148	13.9	214	20.0
Prevent Injury	122	11.4	662	62.0*	284	26.6
Decrease Body Fat	504	47.2*	316	29.6	248	23.2
Treat Arthritis	150	14.0*	618	57.9	300	28.1
Feminize	296	27.7*	494	46.3	278	26.0
Help Resist Disease	119	11.1	642	60.1*	307	28.7
Treat Hormonal Imbalance	335	31.4*	429	40.2	304	28.5

*Indicates correct response to the question.

DISCUSSION

This study represents an attempt to quantify and qualify what appears to be a growing problem of abuse in the general adolescent community. The picture that emerges from the responses of the high school students in this investigation begins with the finding that 4.6% of them have been or are AS users. Apparently, abuse is most common for males in the higher grades. In this particular high school, 11.9% of the senior male population and 7.8% of the junior male population use or have used AS; whereas, 6.9% of the tenth grade males reported use. Usage of AS by females accounted for 4.1% of the total user population. When considered by grade, one percent of the eleventh grade female respondents admitted using AS, and no women from the other grades admitted use. Such a low level of usage by females supports the contention that AS abuse is primarily a male problem. A polling of high school juniors from six Arkansas high schools found only 0.5% of females to be AS users, while 11.0% of the males had used or were currently using steroids.[17] The results of the current study indicate a slightly lower prevalence of usage of AS by adolescent males, although a slightly higher incidence of usage by females. This may suggest that AS usage can be affected by location. In fact, one recent study reported significantly lower usage rates in high schools with small enrollments.[16]

In spite of current laws restricting the distribution of AS, it is apparent that the subjects in this study had little trouble obtaining the drugs. In fact, 15 of the 49 users indicated that they had obtained the AS from multiple sources, many of them utilizing the services of a health professional. Although most physicians consider

it unethical to prescribe them to healthy individuals,[15] AS obtained with a prescription under a physician's care are currently legal. The extent of this legality may soon be curtailed. The Ohio House of Representatives is currently debating House Bill 503 which would prohibit the sale, prescription, dispensing or administration of AS for muscle building or enhancing athletic performance.[24] While legislation of this type may ultimately be part of the solution to the problem of AS abuse, it is possible that by closing this avenue of supply the void left may be filled by individuals with less scrupulous intentions. Indeed, although Moore[18] found in his study that the primary source of AS to be the health care professional, the majority of AS users in the current study sought no professional advice; instead, they obtained the drugs from less legitimate sources. Apparently, illegal actions are taking place. According to FDA enforcement official Don Leggett,[14] a huge black market has developed that may involve $100 million in sales annually. Leggett claims the underground deals involve diverted prescription drugs, veterinary products (such as race horse and beef cattle steroids), and an extensive menu of foreign drugs. A study conducted at Pennsylvania State University found that most teens obtained steroids from a coach, a private gym employee, or other body builders.[15] However, one-fifth of the users said they got their supply from health care professionals such as doctors, veterinarians, and pharmacists. In this study the primary source of AS listed was the "street or black market," with the equally dubious "fellow athletes" as the next most popular source.

The results of this study indicate that many of the students have misunderstandings and misconceptions concerning the properties and

side effects of AS. For example, 65.3% of the students thought AS to be physically addictive, 25.8% said that AS improved cardiovascular endurance, 41.5% indicated that they believed AS to cause hair loss, 11.4% of the respondents indicated that AS prevented injury, and 11.1% thought AS increased resistance to disease. In fact, AS do not cause any of these actions, but may have acquired their reputation through anecdotal communication between users and other individuals. In spite of the many misconceptions by students, this study found no evidence of a difference between males and females regarding their knowledge of AS. Also, no differences were found among grade levels, users versus non-users, and current users versus past users. Since the high school where this study was done has an active drug education curriculum, it is likely that the students' exposure to that information is at least partly responsible for their similarity in knowledge across these categories of students. In a study conducted in Michigan, 21.0% of that state's high school coaches thought steroids improve cardiovascular endurance, and 28.0% felt steroids prevented injuries.[17] Whether these individuals would condone or recommend the use of AS is another question, however, these kinds of results only heighten the concern that misinformation may exacerbate the misuse of AS by young adults. If that is so, then perhaps a rigorous drug education program targeted toward the relevant individuals may have some merit in curtailing the use of AS. Obviously, the issue of AS is neither all pro nor all con. Yet the ethics and dangers involved are clear. This struggle between the push to succeed or perform and the threat to one's health is reflected in the popular media. Bodybuilding magazines contain much information regarding the

"appropriate" methods for AS self-administration.[25] Is it any wonder then, why these drugs are becoming so common in society, and why adolescents have become part of the target group? Certainly, both the risks and the merits involved in AS administration must be made available to athletes, coaches, and parents.

The apparent naivete many of the users exhibited regarding knowledge about AS did not carry over into their patterns of use. All the users in this study employed a sophisticated and dangerous method of taking more than one type of AS preparation, and they were administering them several times per week over long periods of time. This type of usage was, until recently, only seen in the more serious or elite weight athletes, but now it seems to be representative of the typical AS user.[26] The users in this study showed the greatest preference for the orally administered Dianabol and the injectable form of testosterone. Since neither of these drugs have the most efficacious anabolic activity nor the least toxic potential, they were probably not chosen by the users based on their relative merits.[27] However, both drugs do appear to be fairly common, and more importantly perhaps to the thinking of the student user, they are relatively inexpensive.[28] Taking the cheapest form of AS available only compounds the problem of their abuse by young people. Especially in cases such as this when the cheaper drugs also happen to be among those that are the least benign and produce a greater number of adverse side effects.[6] Without proper education, or supervision, young people turning to the black market expose themselves not only to the greed of opportunists, but to additional and unnecessary risk.

A difference was found between the males and females, the user and the non-user, and the current and past-user regarding their opinions concerning the acceptability of AS use. On the other hand, there were no differences among the students in the three grade levels. In general, those who had been in contact with the drugs had formed attitudes or accepted rationalizations for legitimizing AS use. Those students who had not used AS had equally strong opinions in opposition to AS usage. These results bring into question the effectiveness of any drug education program, however rigorous or adamant, that does not detail the hazards of these compounds to the student before that student begins experimentation with AS.

Many questions remain as to the reasons why adolescents take these drugs. Recently an in-depth study was done in order to identify the AS use patterns among the male portion of the general adolescent population. It was found that the primary motivation among high school users was to increase strength among football athletes.[18] This study also found performance enhancement to be the major reason for use, however, appearance improvement ranked a close second, followed by pressure from peers. While the majority of the users participated in sports individually, not associated with a team, an overlap existed in that 57.1% of the steroid users were also involved with school teams and 53.1% claimed to participate in organized sports outside of school (YMCA, city leagues, etc.). This may suggest that perhaps the problem of AS use by these individuals is not influenced so much by laws and education as it is by the social environment. Because of some ingrained, or perhaps innate philosophy, our society places an inordinate amount of significance on winning. That is not to say that

a competitive nature is not a good thing, undeniably it is. The problem arises when winning, or the pursuit of it, becomes like an addiction, smothering our consciences. Inevitably, those addicts among us pursue that fix no matter the cost.

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